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Five Important Factors Influenced by Proper Airflow

Don't be an airflow phony

CLEAN THE COIL: A stopped-up indoor coil will drastically reduce airflow and shorten equipment life.

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I had an interesting question posed to me this past weekend, "What is the importance of proper airflow?" The question seemed basic at first but soon took on a much deeper meaning. Airflow is a topic referenced and discussed a lot in our industry. While it's on the lips of many of us every day, it remains one of the most misunderstood principles in our industry.

Have you ever gotten into a discussion about airflow and had a question that was never truly answered? Since airflow is intangible, it's easy to assume a lot of its properties and give it characteristics that might not be completely accurate. We can't put our hands around it or see it, so it's easy to talk about without any repercussions.

Consider, for a moment, if your customers suddenly understood system airflow could be measured. How would this affect your approach to it? Would you rejoice at such a revelation or would you get a sick feeling in your gut? Let's look at five important factors influenced by proper airflow in an HVAC system and how you can use them to better serve your customers.

Factor No. 1) Equipment Longevity — To get the longest life expectancy from forced-air HVAC equipment, airflow must be correct. This equipment is designed to operate within a specific airflow range. When airflow is outside this range, the life of the equipment is severely impacted. Some of these impacts show up quickly while others take years to appear.

Here are some negative impacts related to low equipment airflow:

• Premature compressor failure;

• Compressor floodback;

• Cracked heat exchangers;

• Premature electronically commutated motor (ECM) failure;

• Intermittently freezing indoor coils;

• Erratic thermostatic expansion valve (TXV) operation (hunting);

• Low superheat (cooling mode);

• High head pressure trips (heat pumps – heating mode);

• Excessive temperature rise (heating mode); and

• Excessive temperature drop (cooling mode).

If you want to shorten the life of your equipment, ignore these warning signs and continue to assume equipment airflow is correct. Future equipment warranties will require static pressure and fan airflow measurements to assure components aren't being destroyed by installation conditions.

Factor No. 2) Equipment Efficiency — Airflow is the main factor determining equipment efficiency and the foundation for the Btu formulas needed to determine it. If airflow is incorrect, everything else will be incorrect. When airflow is off, it's nearly impossible to correctly charge refrigerant or set up a gas furnace. The end result is equipment efficiency falling short of the manufacturer rating.

Some equipment is finicky from an efficiency standpoint. It can unknowingly be equipped with a weak blower paired with a restrictive indoor coil and air filter. Once these components are placed on an undersized duct system, poor operation is the only conclusion.

Equipment may work fine in a laboratory but fail to function as intended once installed in the field. Remember, yellow stickers are only indicators of potential equipment performance. True performance of the equipment must be measured and verified once it has been installed.

The importance of proper airflow expands beyond just the equipment. It must be correct at the equipment first, but the duct system also has to deliver what the equipment is circulating.

The next three factors look at what takes place when airflow is negatively impacted from the duct system.

Factor No. 3) Safety — A factor that is easy to forget regarding proper airflow is safety. Airflow imbalances can contribute to unsafe conditions being created in a home or building anytime the blower is operating. These imbalances are created by both duct leakage and/or a lack of air balancing. Be aware that such imbalances can occur even on perfectly tight duct systems.

The potential for carbon monoxide (CO) poisoning due to airflow imbalances is at the top of the safety list. Fuel-fired appliances depend on a consistent supply of air for safe operation. Airflow imbalances can steal air from fuel-fired appliances and misplace it somewhere it isn't needed or cause flue gases to spill into the living space.

Another source of potential safety issues are attached garages. They are often unintentionally tied to the home by various leaks in framing and duct systems. Airflow imbalances can bring in pollutants often found in a garage, such as CO, from auto exhaust. In addition, other airborne garage contaminants can be circulated into the home by the HVAC system.

Factor No. 4) Comfort — The proper amount of delivered airflow to an individual room is one of the primary factors affecting comfort. When room airflow is low, it’s certain that room will be hot in the summer and cold in the winter. Airflow is what delivers the needed amount of heating or cooling to a room.

Simply looking at duct and register sizes won't assure the correct volume of air flows to a room. This is where the magic of installers comes through. They determine room airflow more than anything else and how much airflow goes into and out of a room by the size of the ducts feeding the room and how well they installed them. A poorly installed duct that is choked off will deliver far less airflow than one installed straight and without restrictions.

Humidity levels and ventilation rates are also determined by the correct amount of airflow. Uncontrolled airflow from duct leakage and air-balancing issues can add excessive moisture to a system. This can overpower the moisture removal side of the system and cause indoor humidity levels to rise. During wintertime operation, this interaction can dehumidify a building, which can make it very dry.

Factor No. 5 System Efficiency — Not only is equipment efficiency influenced by proper airflow, so is system efficiency. It’s important to understand equipment efficiency is not system efficiency. The equipment is a component of the system you build, not the system itself.

Each system is unique to your installation practices and cannot be reproduced by anyone else. You determine efficiency largely by how much airflow from the equipment makes it into the conditioned space.